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"Disaster Victim Identification": An Advanced Forensic Approach in Mass Fatalities: A Review Article

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Review Article

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ABSTRACT

Nowadays disasters are common, may it be natural, accidental, or a result of terrorism, causing the loss of numerous lives. In such disasters, it becomes necessary for the forensic experts to identify the victims and aid in the return of recovered human remains to the victim's family. Today various methods are used for Disaster Victim Identification (DVI), which is making this process of identification rapid.

Keywords: Disaster Victim Identification, PMCT, DNA, Fingerprints.

Introduction

Every day various disasters and calamities are reported which results in the loss of a large number of human lives. There occurs certain disasters which cause the destruction of human body parts on such a level that the identification of these human remains becomes very difficult.[1] In any kind of disaster, identification of the victim is the utmost important thing and it becomes necessary so as to return the remains to their families as well as for judicial reasons.[2]

Mass fatality incidents are also known as 'disasters' produce a huge number of victims.[3] Forensic experts use various kinds of scientific approaches and procedures for identification as well as investigation purposes.[1] This Disaster victim identification is achieved by DVI protocols.[3]

Disaster Victim Identification is not an easy task but it is very essential. This procedure involves the role of many individuals starting from the rescue team to forensic pathologists, odontologists, anthropologists, etc. Various methods are used for the identification purpose of the victims which includes visual identification of the bodies or of the personal belongings recovered from the victims, use of radiology such as Post Mortem Computed Tomography, digital fingerprint, DNA typing, etc.[4]

History of Imaging in Human Identification: Nowadays, Radiology is an established tool for DVI used by forensic odontologists.[5] Radiology was first used for Human Identification in the year 1927 by Culbert and Law. In this case, the ante-mortem and post-mortem radiographs of frontal sinuses of the victims were compared.[3]

Radiography played an important role in the identification of the victims of "Noronic" disaster in Toronto, Canada. Out of 119 victims of that disaster, 24 were positively identified with the help of comparative odontology radiography.[5,6,7]

Role of Radiology in DVI: As the bones and teeth are the last tissues to change after death, radiography proves to be an important tool for the identification of the victims as radiography can reveal essential information about the deceased.[8] It is claimed that 55% of victims of various disasters are identified with the help of various radiological methods.[9] Currently, a maximum number of positive identification in DVI is done using DNA, forensic odontology, and radiology.[10]

Post- mortem and Ante-mortem radiographic images can be used as a comparative tool to identify the victim. Just like fingerprints, radiographic images of the frontal sinus play an important role in victim identification as frontal sinuses are unique to each and every individual. So Ante-mortem and Post- mortem radiographic images of frontal sinus of victims can be compared for identification purpose.[11]

Various Modalities Used for Disaster Victim Identification:

1. Use of Post- Mortem Computed Tomography (PMCT)
2. Use of Fingerprints
3. Use of DNA

Role of PMCT in Disaster Victim Identification: PMCT can be used as an important modality for DVI. It can exclude the need for an invasive examination. PMCT can be used to reconstruct dental data by producing a 3D data set to a single 2D image. However, using PMCT for dental identification will reduce the use of other medical imaging modalities. But, in individuals with dental restorations such as amalgam restorations, PMCTs can't be of much use because of the artifacts produced due to restorations.[3]

The use of CT in DVI helps in the identification of the disfigured body as well as fragmented body parts in a significant way.[12]

PMCT Reporting: In recent years, PMCT is used frequently as an investing modality and hence its use in radiology is also increasing. In DVI, it is necessary to develop a PMCT recording format, which must include

an identification reporting section. A standard PMCT report must include an ample amount of information about the victims, which must be recorded in a standard format. This will help multiple investigators to use this data for identification purposes. Without any correct reporting format, the investigators have to use their judgements about what to include in the reports and how to make their written reports.[3]

Role of Fingerprints in DVI: The role of fingerprints in DVI is significantly increasing for identification. On the other hand, fingerprints are the most commonly used biometric identifier which is used nowadays. Collection of Ante-mortem fingerprints is becoming easier in today's time as the use of biometrics is increasing globally. This method can become complicated in cases where the victims were exposed to extreme heat and no usable fingerprints can be retrieved, hence identification becomes difficult.[13]

Methods for Recording Fingerprint in DVI: Various methods are used for this such as the Ink and Paper method, Use of Fingerprint Powder, and Adhesive labels. Digital methods such as scanners are also in use nowadays. Digital Photography is another mode which can be used when it cannot be recorded physically. The condition of the victim usually decides which methodology to use for capturing the records, but lastly, the result will be the same, irrespective of any method used.[13]

Role of DNA in Disaster Victim Identification: Nowadays, DVI has been made much easier with the help of DNA- based approach. In this method, DNA samples are retrieved from the victims for identification. DNA Typing is comparatively faster as compared to other methods. Extractions of DNA can be carried out within minimal time and family members of suspected victims can provide reference samples for comparison. In the case of fragmented body parts, each and every tissue fragment of the victim should be analyzed for the reconstruction of the body so that comparison can be done with reference samples.[14,15,16]

Conclusion: Disasters can occur at any time and place claiming thousands of lives of individuals. DVI plays a major role in the individual identification of victims in such cases. Various methods are used for DVI and further studies are going on for better approaches so that rapid identification of badly damaged bodies can be done.

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